



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/088,268	09/23/2002	Nobuyuki Komaba	NSG -211 US	8800

7590 12/15/2003

Kenneth N Nigon  
Ratner Prestia  
Suite 301 One West Lakes Berwyn  
P O Box 980  
Valley Forge, PA 19482-0980

EXAMINER
----------

SOHN, SEUNG C

ART UNIT	PAPER NUMBER
----------	--------------

2878

DATE MAILED: 12/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Applicati n No.	Applicant(s)	
	10/088,268	KOMABA ET AL.	
	Examiner	Art Unit	
	Seung C. Sohn	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2002.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☒ Claim(s) 14 and 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 September 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

#### Attachment(s)

- |                                                                                                                    |                                                                             |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                        | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                               | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>5/10/2002</u> | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Drawings***

1. **Figures 1-3, 6 and 10** should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Objections***

3. **Claim 10** is objected to because of the following informalities:

On claim 10, line 4, "critical growth" after "formed by" should be changed to – crystal growth –.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**5. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Iwabuchi et al. (Patent No. US 4,987,505).**

Referring to claim 1, Iwabuchi et al. shows in Figs. 12A & 17A the following elements of Applicant's claim:

a) a plurality of light-receiving elements (Fig. 12A, 52-1 thru 52-4) arrayed in a straight line, each light-receiving element being a pin-photodiode having a p-type layer (Fig. 17A, 92) formed by diffusion (Col. 7, lines 56-60); and

b) a light-shielding film (Fig. 17A, 94) provided on the top surface of the light-receiving element array except at least a part of light-receiving area of each light-receiving element (Col. 7, lines 64-67).

#### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**7. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi et al. (Patent No. US 4,987,505) in view of Ishaque et al. (Patent No. US 5,288,989).**

**Referring to claim 2**, Iwabuchi et al. shows in Figs. 12A & 17A the following elements of Applicant's claim;

- a) a plurality of light-receiving elements (Fig. 12A, 52-1 thru 52-4) arrayed in a straight line, each light-receiving element being a pin-photodiode having a p-type layer (Fig. 17A, 92) formed by diffusion (Col. 7, lines 56-60); and
- b) a light-shielding film (Fig. 17A, 94) provided on the top surface of the light-receiving element array except at least a part of light-receiving area of each light-receiving element (Col. 7, lines 64-67).

Iwabuchi et al. discloses the claimed invention as set forth above, but does not disclose that each light-receiving element constitutes a mesa-structure with the light-receiving elements being isolated to each other by isolation trenches. Ishaque et al. discloses that each light-receiving element constitutes a mesa-structure with the light-receiving elements being isolated to each other by isolation trenches (Col. 4, lines 39-42). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the mesa structure of Ishaque et al. in the device of Iwabuchi et al. in order to separate light receiving elements.

**8. Claims 3 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi et al. (Patent No. US 4,987,505) in view of Ishaque et al. (Patent No. US 5,288,989) and Kaneda et al. (Patent No. JP 404177881A).**

**Referring to claims 3 and 10**, Iwabuchi et al. shows in Figs. 12A & 17A the following elements of Applicant's claim;

a) a plurality of light-receiving elements (Fig. 12A, 52-1 thru 52-4) arrayed in a straight line, each light-receiving element being a pin-photodiode having a p-type layer (Fig. 17A, 92) formed by diffusion (Col. 7, lines 56-60); and

b) a light-shielding film (Fig. 17A, 94) provided on the top surface of the light-receiving element array except at least a part of light-receiving area of each light-receiving element (Col. 7, lines 64-67).

Iwabuchi et al. discloses the claimed invention as set forth above, but does not disclose that each light-receiving element constitutes a mesa-structure with the light-receiving elements being isolated to each other by isolation trenches. Ishaque et al. discloses that each light-receiving element constitutes a mesa-structure with the light-receiving elements being isolated to each other by isolation trenches (Col. 4, lines 39-42). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the mesa structure of Ishaque et al. in the device of Iwabuchi et al. in order to separate light receiving elements. Also, It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form pin-photodiode of Iwabuchi et al. by crystal growth as shown by Kaneda et al. in order to reduce the dark current (see abstract).

**Referring to claim 11**, Ishaque et al. discloses that each light-receiving element of the mesa and waveguide-structure is formed on a first conductivity-type of substrate, a first conductivity-type electrode (123, i.e., p-type conductivity) is formed on the bottom surface of the substrate, and a second conductivity-type (121, i.e., n0type region),

opposite to the first conductivity-type, of electrode is formed on the top surface of the light-receiving element (Col. 4, lines 43-68).

**Referring to claim 12**, Ishaque et al. discloses that the light impinges upon the end surface of the pin-photodiode (Col. 7, lines 21-26).

**Referring to claim 13**, Ishaque et al. discloses that the first conductivity-type is p-type and the second conductivity-type is n-type (Col. 4, lines 43-68).

**9. *Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi et al. (Patent No. US 4,987,505) in view of Applicant's Admitted Prior Art (AAPA).***

**Referring to claim 4**, Iwabuchi et al. discloses the claimed invention as set forth above, but is silent that the pin-photodiode comprises a compound semiconductor material. AAPA discloses that the pin-photodiode comprises a compound semiconductor material (page 1, lines 22-30). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to make the pin-photodiode of Iwabuchi et al. with a compound semiconductor material of AAPA in order to increase the sensitivity of the photodiode.

**Referring to claim 5**, Iwabuchi et al. discloses that pin-photodiode is coated by a passivation film (Fig. 17A, 93, i.e., insulating film) (Col. 7, lines 60-64).

10. ***Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi et al. (Patent No. US 4,987,505) in view of Applicant's Admitted Prior Art (AAPA) and Ogura et al. (Patent No. US 5,475,211).***

**Referring to claim 6**, the modified device of Iwabuchi et al. discloses the claimed invention as set forth above, but is silent that the passivation film comprises SiN. Ogura et al. discloses that the passivation film comprises SiN (Col. 7, lines 14-27). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to make the passivation film of Iwabuchi et al. with a SiN of Ogura et al. in order to properly protect from any contamination.

**Referring to claim 7**, Ogura et al. discloses that the light-shielding film comprises a metal film (Col. 7, lines 14-27).

**Referring to claim 8**, Ogura et al. discloses that the light-shielding film comprises an Au film (Col. 7, lines 14-27).

**Referring to claim 9**, Iwabuchi et al. discloses that the light-shielding film comprises a carbon film (see abstract).

#### ***Allowable Subject Matter***

11. **Claims 14-15** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter:



Claims 14-15 are allowable because the prior art fails to disclose or make obvious, either singly or in combination, a light receiving device comprising, in addition to the other recited features of the claim, "the second conductivity-type of electrodes are connected to the pattern of electrode wirings, and the first conductivity-type of electrode is connected to the second bonding pad".

### ***Conclusion***

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

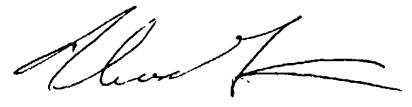
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seung C. Sohn whose telephone number is (703) 308-4093. The examiner can normally be reached on Monday through Friday from 8:30 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703) 308-4852. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SCS

SCS

  
**THANH X. LUU**  
**PATENT EXAMINER**